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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/643,621	08/19/2003	Serguei G. Anikitchev	COHD-5020	4460

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EXAMINER	
VAN ROY, TOD THOMAS	

ART UNIT	PAPER NUMBER
2828	

DATE MAILED: 11/17/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No.	Applicant(s)	
	10/643,621	ANIKITCHEV ET AL.	
	Examiner	Art Unit	
	Tod T. Van Roy	2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *12 September 2005*.

2a)☒ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments see Remarks, filed 09/12/2005, with respect to claim 19 have been fully considered and are persuasive. The rejection of claim 19 has been withdrawn.

Applicant's arguments filed 09/12/2005 have been fully considered but they are not persuasive.

The following is a brief summary of the applicant's arguments and the examiner's rebuttal.

1.) In regards to claims 18-22, 24 and 21 - *Kuniyasu does not teach the etched area to be outside the current non-injection region, or the etched area to be aligned with a longitudinal axis of the device, or that the etched area would provide a diverging lens effect.*

Figure 1D of Kuniyasu discloses the electrode, #17, to not extend fully to the ends of the laser diode. As the electrode does not cover the ends they do not receive an injection of electrical current, and hence are in a current non-injection region. A portion of the etched region is also located in the non-injection region, and therefore meets the limitations of the claim.

The examiner defined an origin of the longitudinal axis in the previous office action that met the limitations of the claim in regards to the etched region being aligned with the axis. Additionally, if the longitudinal axis is defined in the center of the device

the limitation would still be met as the axis would extend through the pumped and unpumped regions, as well as having the etched region aligned with the axis (etched region aligned in parallel with the axis).

The etched area as disclosed by Kuniyasu would create a diverging lens effect as the Y axis effective index would vary along the X axis, which would cause the area to act as a duct having a negative dioptric power, functioning as a diverging lens. This can be verified by referring to the applicant's disclosure, page 15 lines 5-16, and figure 20. This information details the needed shapes and index changes to perform the lens function, which can be inherently found in the sloped etched regions of Kuniyasu.

2.) In regards to claims 1, 3-6, 8-17, and 23 – *Tanaka does not teach the quantum well region to have a higher bandgap in the unpumped section than in the pumped section, and that Tanaka is referring to the waveguide layer.*

Tanaka teaches the region of area #25, fig.17, to have impurities implanted, down through layer #13 (col.19 lines 48-54). This would include the quantum well active region #14 as seen in fig.16. Tanaka then teaches the energy of the entire diffused area, including the quantum well section, to be of a higher bandgap than the quantum well region inside of the resonator section (col.19 lines 57-63). The examiner does agree with the applicant that further reference is made to a waveguide region, but Tanaka has shown that the quantum well region in the diffused area does have a higher bandgap. Tanaka also teaches that the area #25 is a non-injection area as current blocking layers #19-20 cover the disordered waveguide and quantum well region as seen in fig.16. Tanaka then describes that these layers do not cover the region in the

resonator section, referring to fig.4, so that current injection is possible inside of the resonator (col.20 lines 4-15).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 18-22 and 24 are rejected under 35 U.S.C. 102(e) as being anticipated by Kuniyasu et al. (US 6744797).

With respect to claim 18, Kuniyasu discloses a diode-laser having a longitudinal axis (fig.1D, longitudinal axis origin located in left trench), comprising: a substrate (fig.1D #1) having two facets (fig.1D, front and rear), the distance between said facets defining the length of the diode laser, a lower cladding region (fig.1D #3), a lower waveguide region (fig.1D #4), an active region including a quantum-well layer (fig.1D #6), an upper waveguide region (fig.1D #8), and an upper cladding region (fig.1D #9,11), formed on said substrate; an elongated electrode electrically coupled to said upper cladding region and located between said facets and defining an elongated pumped section of the diode laser (fig.1D #17), said electrode having a length less than

the length of the diode-laser (fig.1D #17) thereby leaving at least one un-pumped section adjacent said diode-laser at a first end of said electrode, the longitudinal axis of the diode-laser extending through said pumped and un-pumped sections of the diode-laser (as defined above), and at least one etched area in said upper cladding region of said un-pumped section of diode-laser (fig.1D trenches), said etched area aligned on the longitudinal axis of the diode-laser and having a maximum depth less than or equal to the total thickness of said upper cladding region(not etched past #9), wherein the shape and depth profile of the etched regions provide a diverging lens effect for laser radiation circulating in said waveguide regions (inherent in that the etched trenches provides the Y axis effective index to vary along the X axis leading to a negative dioptric power, and hence the diverging lens effect is present).

With respect to claim 19, Kuniyasu discloses the laser device as outlined in the rejection to claim 18, wherein the etched area has a uniform depth in the longitudinal direction (Kuniyasu, fig.1D).

With respect to claim 20, Kuniyasu discloses the laser device as outlined in the rejection to claim 19, wherein the etched area has a rectangular shape and the depth of said etched area varies in a direction perpendicular to said longitudinal axis of the diode laser, with said maximum depth being on the longitudinal axis (Kuniyasu, fig.1D trenches with axis as defined in 1 above).

With respect to claim 21, Kuniyasu discloses the laser device as outlined in the rejection to claim 19, and further teaches the device to have a recessed area (Kuniyasu, fig.1D trenches) aligned with said un-pumped area having a configuration which

modifies the effective refractive index of the un-pumped area (lateral index changes as a function of etch depth) in order to improve mode performance (Kuniyasu, col.7 lines 14-29).

With respect to claim 22, Kuniyasu discloses the laser device as outlined in the rejection to claim 21, and further teaches the recessed area to be formed in an outer cladding area (Kuniyasu, fig.1D trench formed in cladding regions #9,11).

With respect to claim 24, Kuniyasu discloses the laser device as outlined in the rejection to claim 21, and further teaches the recessed area to create an effective diverging lens for laser radiation circulating in the diode laser (inherent in that the etched trenches provides the Y axis effective index to vary along the X axis leading to a negative dioptric power, and hence the diverging lens effect is present).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1, 3-6, 8-17 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuniyasu et al. (US 6744797) in view of Tanaka (US 6430204).

With respect to claim 1, Kuniyasu teaches a diode-laser having a longitudinal axis (fig.1D, longitudinal axis origin located in left trench), comprising: a substrate (fig.1D #1) having two facets (fig.1D, front and rear), the distance between said facets defining the length of the diode laser, a lower cladding region (fig.1D #3), a lower waveguide region (fig.1D #4), an active region including a quantum-well layer (fig.1D #6), an upper waveguide region (fig.1D #8), and an upper cladding region (fig.1D #9,11), formed on said substrate; an elongated electrode electrically coupled to said upper cladding region and located between said facets and defining an elongated pumped section of the diode laser (fig.1D #17), said electrode having a length less than the length of the diode-laser (fig.1D #17) thereby leaving at least one un-pumped section adjacent said diode-laser at a first end of said electrode, the longitudinal axis of the diode-laser extending through said pumped and un-pumped sections of the diode-laser (as defined above), and at least one etched area in said upper cladding region of said un-pumped section of diode-laser (fig.1D trenches), said etched area aligned on the longitudinal axis of the diode-laser and having a maximum depth less than or equal to the total thickness of said upper cladding region(not etched past #9). Kuniyasu does not teach the quantum-well layer to have a higher bandgap in said un-pumped region than in said pumped region. Tanaka teaches a semiconductor laser device wherein an

un-pumped region (col.20 lines 12-15) is at a higher bandgap than the pumped section (col.20 lines 29-34). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the laser device of Kuniyasu with the bandgap design of Tanaka in order to prevent catastrophic optical damage (Tanaka, col.20 lines 29-34).

With respect to claim 3, Kuniyasu and Tanaka teach the laser device as outlined in the rejection to claim 1, and further teach the etched area to have a rectangular shape and the depth of said etch area to vary in a direction perpendicular to the longitudinal axis of the diode laser with the maximum depth being on said longitudinal axis (Kuniyasu, fig.1D trench on left side with axis as defined above).

With respect to claim 4, Kuniyasu and Tanaka teach the laser device as outlined in the rejection to claim 1, and further teach the electrode to be positioned between said facets providing an un-pumped section of said laser diode at each end of said electrode (Kuniyasu, fig.1D #17).

With respect to claim 5, Kuniyasu and Tanaka teach the laser device as outlined in the rejection to claim 4, and further teach there to be at least one said etched area in said cladding region in each of said un-pumped sections (Kuniyasu, fig.1D etched trenches on either side of electrode #17).

With respect to claim 6, Kuniyasu and Tanaka teach the laser device as outlined in the rejection to claim 5, and further teach the upper cladding region in each of said un-pumped sections to include the same number of said etched areas (Kuniyasu, fig.1D 2 etched regions in each un-pumped region).

With respect to claim 8, Kuniyasu and Tanaka teach the laser device as outlined in the rejection to claim 5, and further teach the un-pumped regions to be at either end of the laser diode (Kuniyasu, fig.1D 1 un-pumped region near each facet).

With respect to claims 9 and 10, Kuniyasu and Tanaka teach the laser device as outlined in the rejection to claim 1, and further teach the electrode to be located with one end thereof adjacent to a said facet and with one un-pumped region between the facet and the electrode (Kuniyasu, col.9 lines 11-14).

With respect to claim 11, Kuniyasu and Tanaka teach the laser device as outlined in the rejection to claim 1, and further teach the active region, and each of said waveguide and cladding regions to include at least one layer of a semiconductor material (Kuniyasu, col.3 lines 47-58).

With respect to claim 12, Kuniyasu and Tanaka teach the laser device as outlined in the rejection to claim 1, and further teach the electrode to have a width greater than about 30um (Kuniyasu, col.12 line 29).

With respect to claim 13, Kuniyasu and Tanaka teach the laser device as outlined in the rejection to claim 1, but do not teach the electrode to have a length of between .5mm to 1.5mm. However these device, and electrode, lengths are well known in the art. The particular length used in Kuniyasu and Tanaka does not appear critical to the operation of the device, therefore it would have been obvious to one skilled in the art to substitute the known length into the system of Kuniyasu and Tanaka by an obvious engineering design choice.

With respect to claim 14, Kuniyasu and Tanaka teach the laser device as outlined in the rejection to claim 1, and further teach the device to include un-pumped sections adjacent to each end of said electrode (Kuniyasu, fig.1D un-pumped regions at either end of electrode #17).

With respect to claim 15, Kuniyasu and Tanaka teach the laser device as outlined in the rejection to claim 14, and further teach there to be an un-pumped regions between ends of said electrode and said facets (Kuniyasu, fig.1D un-pumped regions at either end of electrode #17).

With respect to claim 16, Kuniyasu and Tanaka teach the laser device as outlined in the rejection to claim 15, and further teach the upper cladding layer in each of said un-pumped sections to include the same number of said etched areas (Kuniyasu, fig.1D 2 etched areas in each un-pumped section).

With respect to claim 17, Kuniyasu and Tanaka teach the laser device as outlined in the rejection to claim 1, and further teach the shape and depth of the etched profiles in said etched areas to be selected such that the laser diode operates in only a single transverse mode (Kuniyasu, col.7 lines 14-29).

With respect to claim 23, Kuniyasu and Tanaka teach the laser device as outlined in the rejection to claim 1, and further teach the quantum well layer in the un-pumped region to be a disordered structure (Tanaka, col.19 lines 50-63, wherein the ion implantation leads to the disordering of the well).

Claims 2, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuniyasu in view of Tanaka and further in view of Nakatsuka et al. (US 4872175).

With respect to claim 2, Kuniyasu and Tanaka teach the laser device as outlined in the rejection to claim 1, but do not teach the etched area to have a biconcave shape. Nakatsuka teaches a semiconductor laser device comprising etched biconcave shapes (fig.1). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the laser device of Kuniyasu and Tanaka with the biconcave shapes of Nakatsuka in order to narrow radiant angles of the output beam (Nakatsuka, abs.)

With respect to claim 7, Kuniyasu and Tanaka teach the laser device as outlined in the rejection to claim 5, and Nakatsuka teaches the use of enough biconcave shapes to exceed the increase of the refractive index due to self-focusing (col.2 lines 4-11), but they do not teach the etched portions to be located in different numbers in the un-pumped regions. It would have been obvious to one of ordinary skill in the art at the time of the invention to include the etched lenses on only one side of the device in order to facilitate easier optical coupling to an external waveguide due to the narrowing of the beam's radiant angle (Nakatsuka, abs.) when power is only desired to be out-coupled on one side of the resonator.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tod T. Van Roy whose telephone number is (571)272-8447. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on (571)272-1835. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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